IBM

The IBM Diskette
General Information Manual

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Product Reference Literature

This publication is intended for use by anyone who uses IBM diskettes or who is interested in learning about or using them. You are not required to have any prior knowledge of diskettes, but you are expected to have a basic knowledge of data processing. To help you learn about IBM diskettes, this publication provides:

- General information about the advantages of diskettes, their uses, and their physical appearance
- Some suggestions for handling and replacing diskettes
- Some basic information about the location and addressing of the data on the diskette
- Detailed information about the systems and devices that use IBM diskettes and how the diskettes are organized

In this manual, the term *system* or *IBM system* includes those devices that use diskettes but are not, by definition, systems.

Related Publications

This publication is designed to present general information about IBM diskettes. For more specific information about the way diskettes are used in individual systems, refer to the appropriate system documentation. Generally, diskette information appears in publications such as:

- Operator's guides
- System summaries
- Functions reference manuals
- System introductions
- Component descriptions
- Customer setup manuals

Fifth Edition (August 1979)

This is a major revision of, and obsoletes, GA21-9182-3. Because this publication has been completely reorganized, revised, and expanded, it should be read in its entirety. Information in this publication is subject to change. Changes are periodically made to the information herein; changes will be reported in technical newsletters or in new editions of this publication.

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The IBM Diskette and Its Protective Envelope

THE IBM DISKETTE

The IBM diskette is a small, convenient, storage medium for use on various data processing systems and devices. The facing page contains a photograph of an IBM diskette and its protective envelope. The IBM diskette is composed of two parts: the semirigid plastic jacket that protects the disk, and, sealed inside the jacket, a thin, flexible disk that turns freely inside the jacket. The disk, coated with a magnetic material, provides the recording surfaces of the diskette. These surfaces are kept clean by a low-friction liner in the jacket.

The diskette is ordinarily used singly. However, there are IBM systems that use diskettes enclosed in containers that can hold up to 10 diskettes. These containers are called magazines. When it is used in a system, the entire magazine slides into the diskette drive. (A diskette drive is the device that reads from or writes on diskettes.)

THE ADVANTAGES OF DISKETTES

For years, the primary permanent storage device in data processing was the punched card. Eventually, however, storing the great quantities of punched cards needed to maintain an active system became a burden. The diskette provides one solution to the storage problem, but there are other advantages in using diskettes:

- Diskettes can contain more information than cards.

  The amount of information that can be stored on individual diskettes is many times greater than the amount of information that can be stored on individual cards.

- Diskettes can be rewritten many times; cards can be completely punched only once.

  Diskettes can be reused to store new information after the information they contain is no longer needed. Cards cannot be punched a second time; once the information they contain is obsolete, the cards must be stored or thrown away.

- Diskettes can be corrected, but the information on cards cannot be changed.

  Incorrect data on diskettes can be corrected by placing the correct information in the locations containing incorrect information. This is a simple rewriting process. Because holes are punched in cards to store information, new cards must be punched to correct errors.

- Diskettes are easier to handle than cards.

  The information stored on diskettes can be more easily moved, stored, and mailed than the same amount of information stored on cards.

THE PURPOSES FOR DISKETTES

Diskettes can be used as storage media for various kinds of information. The particular purpose for the diskette varies with the application for which the diskette is used in any particular system. Because of these variations, this manual makes no attempt to list every possible use for diskettes, but among the more standard uses are:

- Storing data for exchange between devices or systems
- Saving system data, offline, to be restored to the system at a later time as needed
- Logging or buffering transaction data for batch processing
- Processing system data (usually in small systems or in control units)
- Storing and loading system microcode
- Distributing programs
- Storing and loading diagnostic information

Some systems and devices have diskette drives that are not accessible to the operator. The diskettes in these drives usually contain microcode or diagnostic information for use in the particular systems or devices.

Because the uses for diskettes vary from system to system, IBM produces diskettes of varying types and capacities. Briefly, there are three basic types of diskettes, they are:

- IBM Diskette 1. This diskette contains information on one side only.
- IBM Diskette 2. This diskette contains information on both sides.
- IBM Diskette 2D. This diskette contains information written in double-density encoding (twice the standard number of bits written on a given track) on both sides.

A complete description of the diskettes is provided under *Diskette Types,* later in this manual.

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The Physical Features of Diskettes

Physical features are those characteristics that make any object consistently recognizable. The protective envelope and all the various labels, holes, slots, notches, and dimensions form the physical features of the IBM diskette.

THE PROTECTIVE ENVELOPE

The protective envelope is an essential part of all IBM diskettes, even though you must remove the envelope before you can put the diskette in the diskette drive. The object of protecting a diskette is to protect the information contained on that diskette.

Except when it is in the diskette drive or a magazine, the diskette should always be in its protective envelope.

An unprotected diskette is stored information that is vulnerable. The information is subject to unknown alteration or destruction from many sources. Some examples of things that can damage diskettes that have been left out of their protective envelope are: fingerprints, smoke, sneezes, spilled drinks, coughs, dust, and ashes. (Diskette damage is discussed in detail under *Diskette Handling,* later in this manual.)

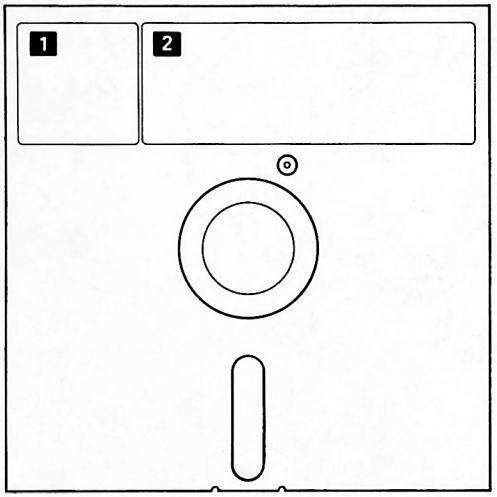
THE IDENTIFYING AND OPERATING FEATURES

The remaining features are part of the diskette itself. The identifying features are for your use while the diskette is outside the diskette drive and are visible when the diskette is in its protective envelope. The operating features are those features that allow the diskette to be read from or written upon while it is inside the diskette drive.

The Identifying Features

There are diskette labels on which you can record the descriptive, operational, and historical information that you want to remain with the diskette. Further information on the labels is provided under *Labeling Diskettes* later in this manual.

The following illustration shows numbers that are used to key each feature to the paragraph that describes it.



1 Permanent Diskette Label

Use this label to record information describing the diskette and its condition. Record information such as:

- The serial number (volume ID; see Appendix D)
- The date you first used the diskette
- The location of any defective cylinders

2 Temporary Identification Label

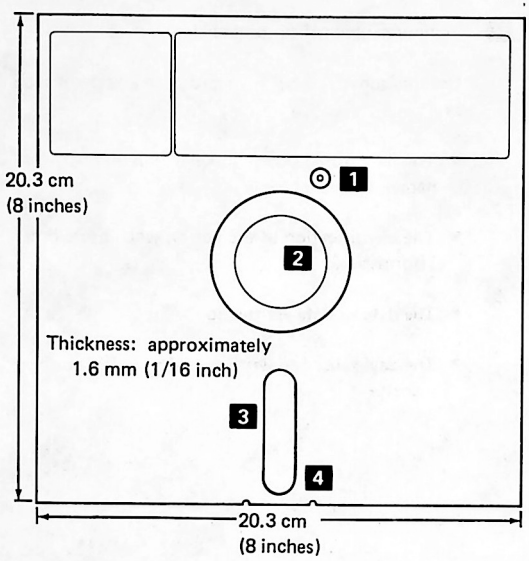
Use this adhesive label to record changing items such as:

- The data stored on the diskette; job numbers, names, and dates
- The identification of the person who entered the information
- The date of data verification
- The device used to write the information on the diskette

The Operating Features

Each of these features contributes in some way to the operation of the diskette when it is in the diskette drive. The operating features are holes in the diskette jacket, and two of the holes extend through the disk that is sealed inside the jacket.

The following illustration shows numbers that are used to key each feature to the paragraph that describes it.

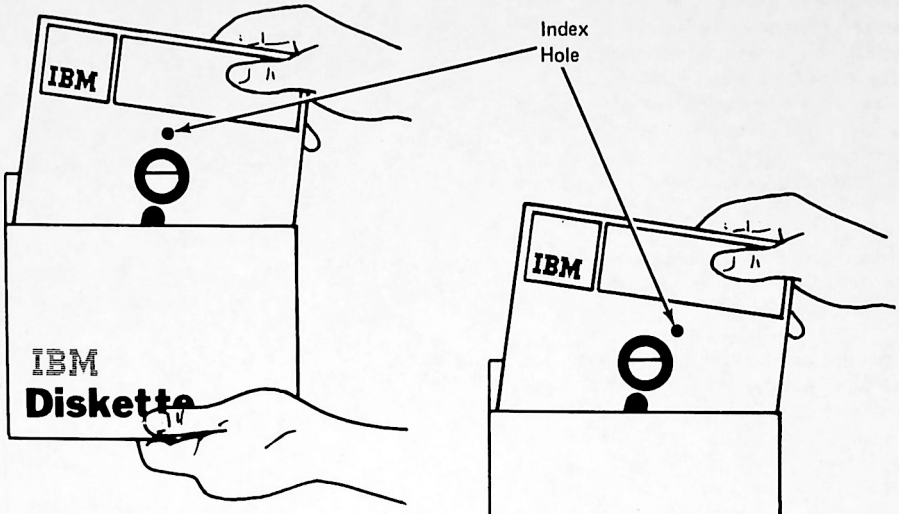


1 Index Hole

There is an index hole that passes completely through the diskette. When the diskette is in the diskette drive, the disk turns inside the jacket. Once per revolution, the holes in the disk and the jacket line up and allow a beam of light to shine through the index hole. The light beam is used for a number of purposes, some of which are:

- Timing for various functions within the diskette drive
- Verifying that the diskette is of the correct type for the diskette drive
- Verifying that the diskette is properly installed in the diskette drive
- Providing timing and synchronizing for communications between the system or device and the diskette drive

The following illustration shows that the index holes on one-sided and two-sided diskettes do not occupy the same location on the diskette.



One-Sided Diskette (Diskette 1)

Two-Sided Diskette (Diskette 2 or 2D)

2 Drive Spindle Hole

The diskette drive spindle requires that there be a hole in both the diskette jacket and the disk inside the jacket. When the diskette is seated in the diskette drive, the drive spindle moves into the drive spindle hole and clamps to the disk, causing the disk to begin turning.

3 Head Slot

The head slot exposes the recording surface of the diskette to the read/write head. There is a head slot on both sides of each type of diskette. On a one-sided diskette, a pressure pad enters the head slot opposite the read/write head. On a two-sided diskette, data is recorded on both sides of the diskette, so a read/write head enters both head slots.

4 Stress Relief Notches

The stress relief notches in the diskette jacket aid in distributing the stresses that occur in the head slot area if the diskette is accidentally bent.

THE DISKETTE DRIVE

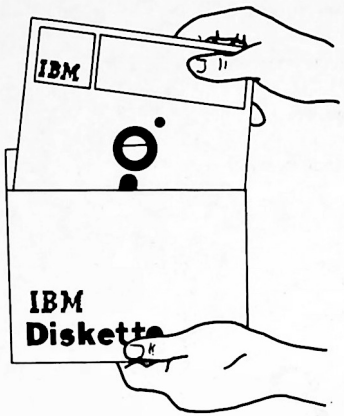
The diskette drive provides the means for reading or writing on the diskette. Under control of the system, the diskette drive transfers encoded information to or from the diskette by using an electromagnetic read/write head. The drive moves the read/write head into position on the moving recording surface of the diskette and writes magnetically charged spots (small magnetic fields) at specific locations (addresses) on the recording surface. The information written at an address remains there until it has been replaced by new information or is magnetically erased.

To read from the diskette, the diskette drive moves the read/write head to the proper position on the diskette recording surface, finds the proper address, and senses and transmits the information to the system.

Because there are diskettes that can store information on both sides, some diskette drives have two read/write heads, one on each side of the diskette.

IBM diskettes are designed to withstand the stresses of normal and frequent handling. However, there are some precautions that you should note as you handle your diskettes. By careful observance of these precautions, and guarding against carelessness in everyday use, your diskettes will provide long and reliable service.

The proper way to remove a diskette from its protective envelope is shown in the following illustration:



Grasp the diskette by its upper edge, and pull it out of the envelope.

Be sure to keep the protective envelope and return the diskette to the envelope every time you remove the diskette from the diskette drive. As its name implies, the protective envelope is provided to help prevent damage to the diskette. The damage on a diskette can cause problems that range from intermittent reading or writing errors to a permanent loss of the information contained on the diskette.

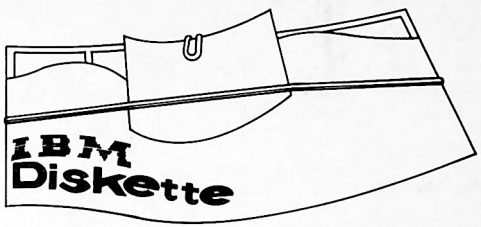
CONSERVING INFORMATION

When a diskette is damaged or mishandled, the information contained on that diskette can be lost or altered. The following paragraphs and illustrations point out some of the more common handling mistakes. These mistakes are almost always the result of a moment's carelessness. Diskettes are not, in themselves, highly expensive; but the information they contain can be very costly if it is lost.

Diskettes can be damaged in many ways. They can be bent, creased, warped, dented, contaminated, or magnetically altered.

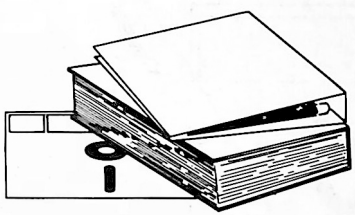
Bent Diskettes

IBM diskettes are made to be flexible, but the flexibility is to allow the diskette to function more freely in the diskette drive. Diskettes should not be grasped too vigorously, especially near the head slot, nor should paper clips or rubber bands be placed on them. The bending caused by any of these actions can be permanent.



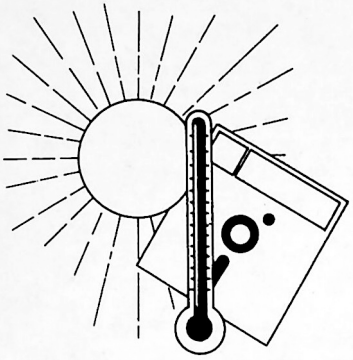
Creased Diskettes

Folding a diskette or placing heavy objects on it can cause it to be creased. A crease is permanent and ruins the diskette.



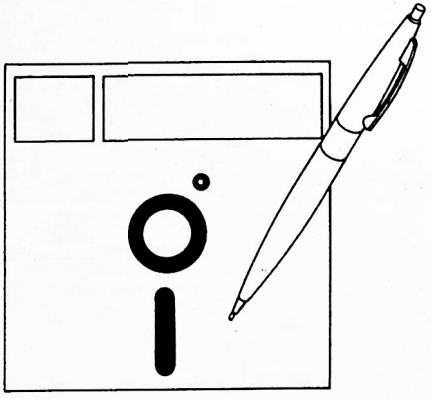
Warped Diskettes

Warping is usually the result of exposing the diskette to temperatures above the safe limit (see *Environmental Requirements,* later in this chapter). However, there are other causes for warping also. A diskette that is held in a bent position for too long will warp. Improper storing can also cause diskettes to warp. A diskette that is warped will never return to its original shape.



Dented Diskettes

You should use a fiber-tip pen to mark on diskette labels. Pressure from a ball point pen might cause dents in the recording surface. Dents result in lost information because the read/write head loses contact with the recording surface.

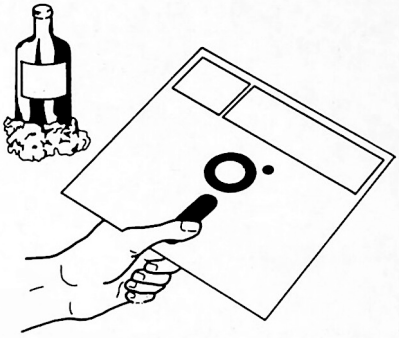


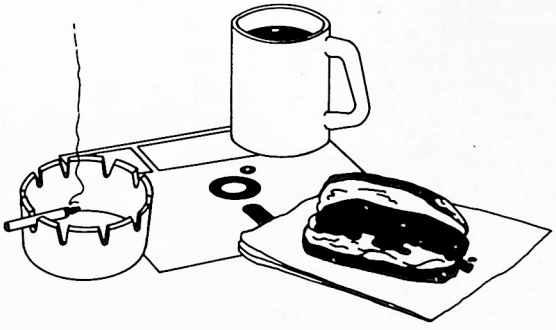
Pencils are not recommended because they are erasable. You should never erase on a diskette because the eraser dust can get inside the diskette jacket and contaminate the recording surface. Contamination is discussed in the next paragraph.

Contaminated Diskettes

A diskette is damaged by contamination when the recording surface is touched, spotted, or dampened by an oily, sticky, magnetic, abrasive, or, in some cases, a nonabrasive substance. Examples of these substances are:

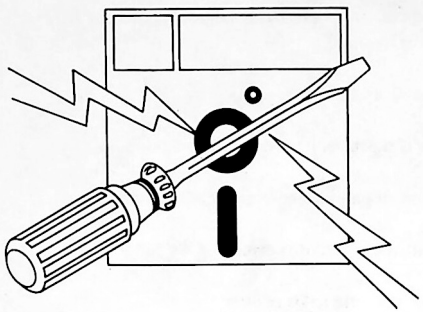
- Fingerprints or smoke (oily)
- Soft drinks or coffee (sticky)
- Ferrous dust or filings (magnetic)
- Dust or filings (abrasive)
- Pencil eraser dust (nonabrasive)





Magnetically Altered Diskettes

Do not place magnets or magnetized objects near the diskette. The magnetic field produced by these magnets can effectively erase information from the surface of the diskette. The diskette does not suffer any physical damage, but the information it contains may no longer be accurate.



INSERTING DISKETTES

The method by which the diskette is locked into the diskette drive varies with the type of diskette drive you have. There are, however, some general statements that should be made about diskette insertion. Always exercise care in placing a diskette in a diskette drive or in a diskette magazine. Be sure you:

1. Carefully remove the diskette from its protective envelope. Be careful not to touch any of the exposed areas of the recording surface.

2. Without bending the diskette, slowly push the diskette into the diskette drive or magazine until it stops.

3. Slowly close the diskette drive cover or move the diskette locking lever.

REMOVING DISKETTES

Always exercise care when removing a diskette from a diskette drive or a diskette magazine. Depending on the type of diskette drive you have, be sure you:

1. Completely open the diskette drive cover, move the diskette locking lever as far as it will go, or lower the diskette magazine retaining spring.

2. Without bending the diskette, slowly pull the diskette completely clear of the diskette drive or magazine. Be careful not to touch any of the exposed areas of the recording surface.

3. Carefully put the diskette back into its magazine.

LABELING DISKETTES

There are two labels provided for each diskette. The permanent labels are already attached to the diskette jackets, and the temporary labels come in a packet with each order of 10 diskettes. The temporary labels come in five different colors: red, blue, green, yellow, and gray. The colors allow you to identify the various types of information without having to read the labels. A description of the two labels, and some examples of the kinds of entries you could make on them, is provided under *The Physical Features of Diskettes,* earlier in this manual.

As discussed under *Diskette Handling,* earlier in this manual, a fiber-tip pen is the only recommended writing instrument for marking on the diskette labels. Always have the diskette in its protective envelope when you are writing on the labels; your hand or wrist could accidentally contact and contaminate the recording surface. The envelope is cut away to permit you to write on either label.

When starting a new job on a diskette, cross out, rather than erase, the old information on the label (the dust from the erasure can get inside the diskette jacket and contaminate the recording surface). When the label is full, remove it and attach a new one. Do not put new labels over old ones because the label buildup can affect the performance of the diskette drive. Do not attach labels to the reverse side of the jacket and do not cover any of the holes.

Replace the temporary labels every 6 months even if they are not filled. Otherwise, the adhesive can harden and make the label difficult to remove.

If you wish, you can attach the temporary labels to the protective envelope instead of the diskette jacket. Write the diskette serial number on the envelope and on the permanent label to ensure that you will always return the diskette to the correct envelope.

STORING DISKETTES

Environmental Requirements

Temperature: 10° C to 51° C (50° F to 125° F)

Relative humidity: 8% to 80%

Maximum wet bulb temperature: 29° C (85° F)

CAUTION
If a diskette has been stored in an area in which the temperature is markedly different from the operating temperature of the diskette drive, do the following:

1. Remove the diskette from its shipping container.
2. Wait 5 minutes for the diskette to adjust to the operating temperature of the diskette drive. You must wait longer if you are using a diskette magazine because the diskettes are closely packed in the magazine and will change temperature more slowly.

Diskette Magazine Storage

Store diskette magazines so they stand vertically. If the magazines contain diskettes, be sure to put the lid on the magazine to lock the diskettes in position and inhibit warping.

Short-Term Storage

You may store diskettes flat in their envelopes, in stacks of 10 or less, when you need the diskettes for immediate use. If you store the diskettes vertically, support them so they do not lean or sag.

Long-Term Storage

If you do not need the diskettes immediately, you may store them in their original shipping cartons with each diskette in its protective envelope. Shipping cartons can be stored either vertically or horizontally.

Note: Do not apply pressure to diskette envelopes or cartons because pressure can warp the diskettes.

SHIPPING DISKETTES

When shipping a diskette, always label the package DO NOT EXPOSE TO HEAT OR SUNLIGHT. When receiving a diskette, check the carton and the diskette for possible damage. Diskettes can be safely exposed to temperatures from −40° C (−40° F) to 51° C (125° F) during shipment.

See *Diskettes, Supplies, and Accessories* for a list of the shipping and packing materials available from your IBM IRD representative.

To pack one diskette:

- Place the diskette in its protective envelope.
- Put the envelope in a single-diskette carton.

To pack multiples of 10 diskettes:

- Place each diskette in its protective envelope.
- Put 10 diskettes in a 10-pack.
- Put each 10-pack between spacers to prevent damage during shipping.
- Insert top and bottom pads in the carton.
- Place the 10-packs and their spacers in the appropriate sized carton.

CAUTION
Do not use so much filler that the diskettes are tightly compressed; compression can warp the diskettes.

- Fill the open space in partially filled cartons and 10-packs with a filler that cannot contaminate the diskette or enter the diskette jacket.

You can prevent most problems from occurring by periodically examining your diskettes, handling them carefully (see *Diskette Handling,* earlier in this manual), and replacing them when necessary. This chapter offers some things you should look for and some suggestions that might help you know when replacement is needed.

DAMAGED DISKETTES

You should replace diskettes that are:

- Folded
- Creased
- Warped
- Dented
- Contaminated
- Scratched

You may be able to recover the information from a diskette that has been folded or warped if the damage is not too severe. The disk must be free to turn inside the diskette jacket in order to recover the information. After you have recovered the information from the diskette, however, discard the damaged diskette.

Carefully examine any diskette that you suspect may have been exposed to excessively high temperatures.

You may be able to detect dents by turning the disk inside the diskette jacket and carefully examining the recording surface.

Note: If you try to turn the disk inside the diskette jacket, be very careful not to touch any portion of the recording surface. Any fingerprints on that surface contaminate the surface and ruin the diskette.

If you insert a contaminated diskette into a diskette drive, the contaminants can be transferred to the read/write head and from the read/write head to the next diskette to be inserted in the drive. The read/write head may also be damaged.

You may be able to recover the information from a diskette that has had a substance spilled on it if you are positive that you can rinse or wipe the substance from the diskette without scratching the recording surface or leaving a residue. *If you are not sure, do not try to use the diskette.* If you know you can rinse the substance away, use only clean, cool water. Again, be careful not to scratch the recording surface or get fingerprints on it. Any kind of cleanser can contaminate the diskette, and warm water can warp the diskette. Solvents can dissolve and ruin the recording surface.

WORN DISKETTES

When diskettes are used for data exchange as defined in this manual, recording surface wear is not a frequent problem. However, because the read/write head is in contact with the recording surface when reading or writing, wear does occur on the surface over a period of time. Eventually, this wear can cause areas on the recording surface in which readable records cannot be written. (Of course, the handling, contamination, and environmental concerns discussed earlier in this manual also affect the length of time a diskette can remain in service.)

Some systems use diskettes to store the active processing file for the system. When the diskette is used in this way, the read/write head is repeatedly lowered to the diskette surface. The repeated loading of the read/write head can increase the wear rate. Ultimately, aside from external factors, wear is dependent upon the total usage of the individual tracks on the diskette.

SUGGESTIONS FOR DISKETTE OPERATIONS

Your diskette operations will be smoother if you establish a routine for tracking your diskettes and learning approximately how much service you can expect from each of them. The following suggestions can help you set up and run your operation:

- Before using a new diskette, assign a serial number to it and record the number on the permanent diskette label and in the space provided in the volume ID field. (See Appendix C.)
- Keep a log of your diskettes by serial number and the date you first used the diskette.
- Use your diskette log in combination with the information on the diskette labels to track the average length of time you receive satisfactory service from your diskettes.
- Distribute your information over the diskette so that reading and writing occur over the entire recording surface.
- Be prepared to handle unexpected problems. Some diskette problems, especially those related to diskette damage, are unpredictable, and can occur at any time.
- Make provision for an adequate recovery plan. Know what you must do to ensure that your vital information is safe. If necessary, make duplicate diskettes.

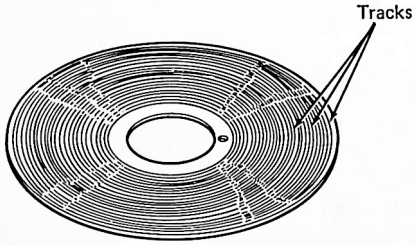
If a diskette causes errors, you probably will have to replace it. If your system allows you to reinitialize, try that, but if the errors persist, discard the diskette. (See Appendix C.)

Diskettes contain libraries, or parts of libraries, in which information is stored for safekeeping until needed. The concept of a library also bears with it the idea that any information stored there is accessible upon demand. Information accessibility, then, requires a form of addressing that can be used to find the information quickly. An address on a diskette is composed of a track or cylinder number, a read/write head number, and a record or sector number. Each of these numbers is described in the following paragraphs.

THE TRACK

Everything stored on the diskette is in the form of records whose primary address is the track or cylinder number (the cylinder concept is described later in this manual).

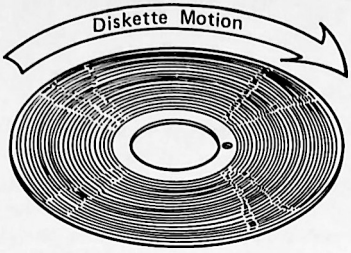
The diskette drive contains a carriage that can move the read/write head to any one of 77 distinct positions on the diskette recording surface. A distinct movement of the read/write head is required to get from one position to the next, therefore, if the read/write head is held stationary in one position after another, the path formed on the surface of the turning disk is one of concentric circles, not a spiral. Each of the concentric circles is a track. For addressing purposes, the tracks are numbered from 00 through 76.

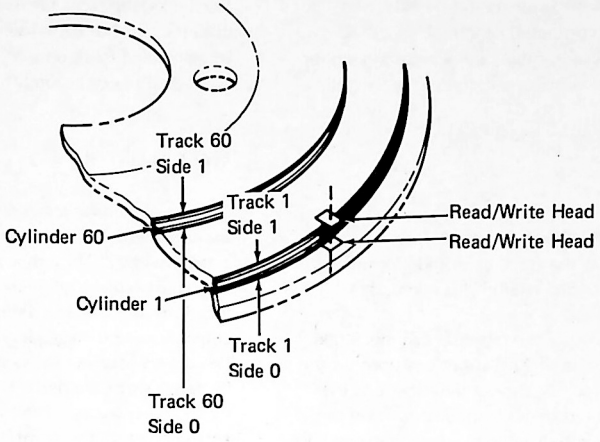


On a one-sided diskette, information is recorded on only one side of the diskette; on a two-sided diskette, information is recorded on both sides. The label side of a two-sided diskette is side 1; the opposite side is side 0. A one-sided diskette uses side 0 only. The diskette drive for two-sided diskettes has a read/write head on each side of the diskette. Each track on side 0 of a two-sided diskette has an associated track on side 1. The read/write heads are numbered to correspond to the diskette side number.

THE CYLINDER

The name *cylinder* refers to both of the tracks available to the read/write heads at any of the 77 locations on the two-sided diskette. (Note that the terms *track* and *cylinder* are interchangeable. Cylinder is also used to refer to the track locations on a one-sided diskette.) The idea of the cylinder comes from the imaginary, geometric figure formed by a line drawn between the two read/write heads (through the diskette) when the heads are stationary over their respective, moving tracks. The following illustration shows an enlargement of a segment of the two diskette recording surfaces. The read/write heads are in position over track 1. As the diskette moves between the heads, the line between the heads forms a truncated cylinder. The cylinder concept applies to any of the 77 tracks (track 60 is also illustrated). Because the track and cylinder locations are identical, cylinder addresses are also numbered from 00 through 76.





The time saved justifies the use of the cylinder concept. It takes time for the access mechanism to move the read/write heads from track to track. However, by using an addressing scheme that reads or writes first one side of the diskette and then the other, two tracks can be utilized without moving the heads. The diskette drive switches from head to head electronically. Compared with any mechanical movement, electronic switching is almost instantaneous.

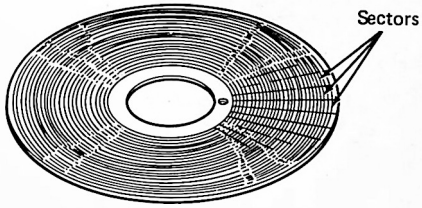
THE HEAD

The term *head* refers to the read/write head (or heads) in the diskette drive. The read/write heads are described in detail under *The Diskette Drive,* earlier in this manual. The concept of electronic head switching was mentioned in the preceding paragraph.

The head number is either a hex 00 or a hex 01 to correspond to the side of the diskette the read/write head is on. The head number is always hex 00 on one-sided diskettes.

THE SECTOR

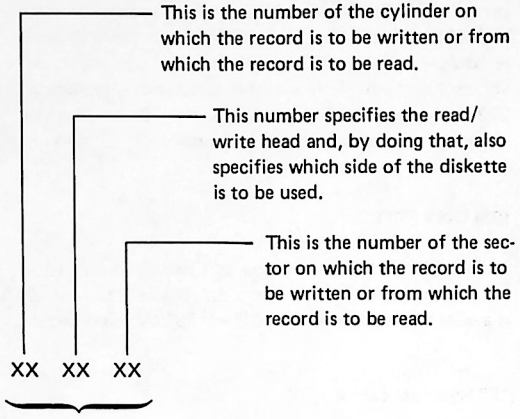
To allow increasingly specific addressing, the track or cylinder is uniformly divided into arcs called sectors. Each sector is addressable.



Cylinder 0, side 0 always contains 26 sectors with 128 bytes per sector. The number of sectors on cylinders 1 through 76 depends on the diskette type and the number of bytes per sector for that diskette type (see *IBM Diskette Types,* later in this manual).

THE ADDRESS

In format, the address of any record on a diskette is a composite of the elements of addressing just discussed: the track or cylinder number, the read/write head number, and the record or sector number. Each of these numbers is a two-digit hexadecimal value. The digits are arranged in the address in order of increasing definition. (In the following illustration, X = a hexadecimal digit.)


This is the number of the cylinder on which the record is to be written or from which the record is to be read.
This number specifies the read/ write head and, by doing that, also specifies which side of the diskette is to be used.
This is the number of the sector on which the record is to be written or from which the record is to be read.
XX XX XX

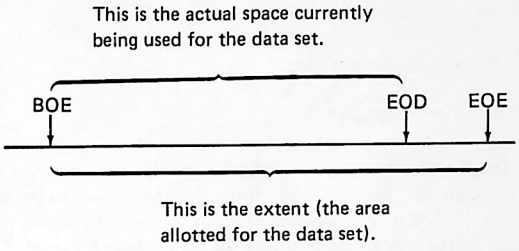
This is the complete address.

The Index Cylinder

Cylinder 0 is the outermost cylinder on the diskette and is called the index cylinder. This cylinder is reserved for information that describes the diskette and its contents. The descriptive information includes volume and owner identification and other information associated with data set (a group of related records) on the diskette. The information about the data sets includes the name of the data set and the addresses associated with the data set.

The continuous space occupied by or reserved for a particular data set is called an extent. Extents also use addressing to achieve efficient reading and writing operations.

The address at the beginning of the extent is called the BOE (beginning of extent). The address at the end of the extent is called the EOE (end of extent). If a data set does not use all of the space alloted to it by the BOE and EOE addresses, another address for the end of the data is called the EOD (end of data). The EOD address identifies the next unused area within the extent or shows that the data has been written to the EOE address. The following illustration shows the relationships of the BOE, EOD, and EOE.


This is the actual space currently being used for the data set.
BOE
EOD
EOE
This is the extent (the area allotted for the data set).

Alternative Cylinders

The last two cylinders on the diskette, 75 and 76, are reserved as alternative cylinders. That is, these cylinders are used as replacements for cylinders that are defective. These two cylinders are not used for storing information until they are used as alternative cylinders.

IBM Diskette Types

IBM DISKETTE 1

The IBM Diskette 1, also known as a one-sided diskette, has a recording surface on one side only. Because the diskette drive can have a read/write head that contacts both sides, the side of the diskette that is opposite the recording surface is also finished to a smooth surface. The IBM Diskette 1 is available in three formats: 128, 256, and 512 bytes per sector.

128 Bytes per Sector

(IBM Part 2305830)

This diskette has 77 tracks (00 through 76), with one track per cylinder. Each cylinder on this diskette, including the index cylinder (00), consists of 26 sectors with 128 bytes per sector. Cylinders 1 through 74 are available for user data providing 1924 sectors or 246,272 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

When this diskette is used for basic data exchange, 73 cylinders (1 through 73) are used. Cylinder 74 is not used. A basic data exchange diskette provides 1898 sectors or 242,944 bytes.

256 Bytes per Sector

(IBM Part 2305845)

This diskette has 77 tracks (00 through 76), with one track per cylinder. The index cylinder (00) consists of 26 sectors with 128 bytes per sector. Cylinders 1 through 76 have 15 sectors per cylinder. Each sector is 256 bytes long. Cylinders 1 through 74 are available for user data providing 1110 sectors or 284,160 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

512 Bytes per Sector

(IBM Part 1669954)

This diskette has 77 tracks (00 through 76) with one track per cylinder. The index cylinder (00) consists of 26 sectors with 128 bytes per sector. Cylinders 1 through 76 have 8 sectors per cylinder. Each sector is 512 bytes long. Cylinders 1 through 74 are available for user data providing 592 sectors or 303,104 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

IBM DISKETTE 2

The IBM Diskette 2, also known as a two-sided diskette, has a recording surface on each side. The IBM Diskette 2 is available in two formats: 128 and 256 bytes per sector.

128 Bytes per Sector

(IBM Part 1766870)

This diskette has 77 cylinders (00 through 76). The index cylinder (00) consists of 26 sectors with 128 bytes per sector on each side of the diskette for a total of 52 sectors. Cylinders 1 through 76 each have 26 sectors with 128 bytes per sector on each side of the diskette for a total of 52 sectors per cylinder. Cylinders 1 through 74 are available as primary cylinders for data providing 3848 sectors or 492,544 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

256 Bytes per Sector

(IBM Part 2736700)

This diskette has 77 cylinders (00 through 76). The index cylinder (00) consists of 26 sectors with 128 bytes per sector on each side of the diskette for a total of 52 sectors. Cylinders 1 through 76 each have 15 sectors with 256 bytes per sector on each side of the diskette for a total of 30 sectors per cylinder. Cylinders 1 through 74 are available as primary cylinders for data providing 2220 sectors or 568,320 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

IBM DISKETTE 2D

The IBM Diskette 2D is a two-sided, double-density diskette. Two-sided, of course, means that the diskette has a recording surface on each side. Double density means that the bits on this diskette are written at twice the density of the bits on the IBM Diskettes 1 and 2.

256 Bytes per Sector

(IBM Part 1766872)

This diskette has 77 cylinders (00 through 76). The index cylinder (00) consists of 26 sectors with 128 bytes per sector on side 0 and 26 sectors with 256 bytes per sector on side 1, for a total of 52 sectors. Each 256-byte sector on cylinder 0 contains two 128-byte data set labels. Cylinders 1 through 76 each have 26 sectors with 256 bytes per sector on each side of the diskette for a total of 52 sectors per cylinder. Cylinders 1 through 74 are available as primary cylinders for data providing 3848 sectors or 985,088 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

512 Bytes per Sector

(IBM Part 1669044)

This diskette has 77 cylinders (00 through 76). The index cylinder (00) consists of 26 sectors with 128 bytes per sector on side 0 and 26 sectors with 256 bytes per sector on side 1, for a total of 52 sectors. Each 256-byte sector on cylinder 0 contains two 128-byte data set labels. Cylinders 1 through 76 each have 15 sectors with 512 bytes per sector on each side of the diskette for a total of 30 sectors per cylinder. Cylinders 1 through 74 are available as primary cylinders for data providing 2220 sectors or 1,136,640 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

1024 Bytes per Sector

(IBM Part 1669045)

This diskette has 77 cylinders (00 through 76). The index cylinder (00) consists of 26 sectors with 128 bytes per sector on side 0 and 26 sectors with 256 bytes per sector on side 1 for a total of 52 sectors. Each 256-byte sector on cylinder 0 contains two 128-byte data set labels. Cylinders 1 through 76 each have 8 sectors with 1024 bytes per sector on each side of the diskette for a total of 16 sectors per cylinder. Cylinders 1 through 74 are available as primary cylinders for data providing 1184 sectors or 1,212,416 bytes. Cylinders 75 and 76 are reserved for alternative cylinder assignment.

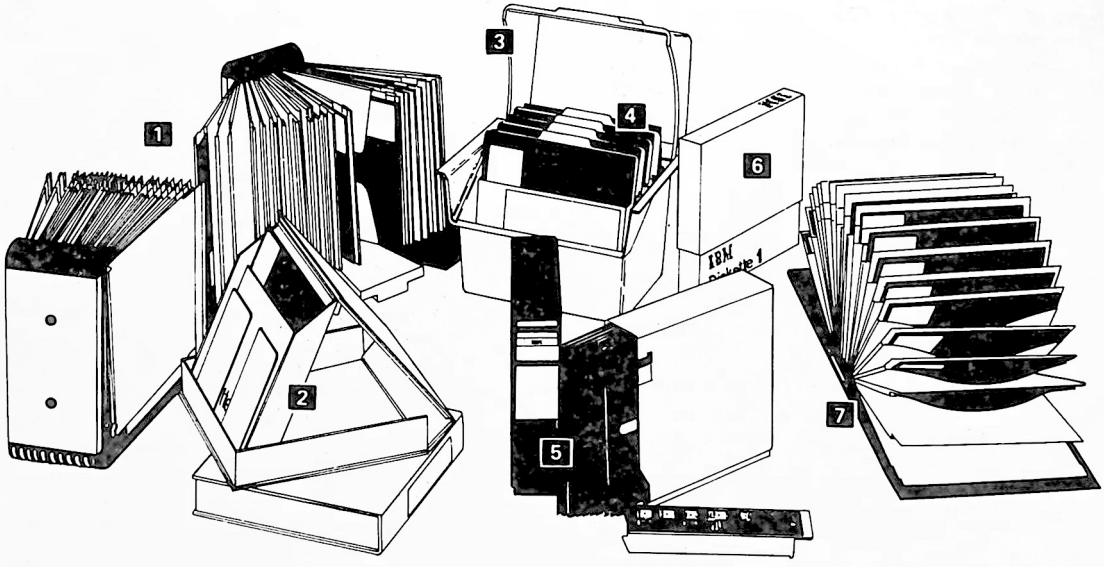
Accessories, Diskettes, and Supplies

IBM produces many supplies that are related directly to diskette use. These supplies include items you can use for shipping, storing, or working with diskettes. Your IBM IRD (Information Records Division) representative can furnish these supplies to you.

Note: The numbers in the following table and illustration are keys that associate the listed item with its illustration.

Accessory		Sold in Multiples of	Weight
1	Desk stand (20 diskettes)	1	2.9 kg (6.5 lbs)
2	Library case (10 diskettes)	5	2.5 kg (5.6 lbs)
3	Fiftifile (50 diskettes)	1	0.7 kg (1.5 lbs)
4	Tab dividers for fiftifile	5	—
5	Diskette magazine (10 diskettes)	5	3.7 kg (8.0 lbs)
6	10-Pack slip case (10 diskettes)	30	7.7 kg (17 lbs)
7	Fan file 10 (10 diskettes)	1	1.5 kg (3.3 lbs)
7	Fan file 20 (20 diskettes)	1	2.2 kg (4.8 lbs)

Note: Diskettes are not included with these accessories. The quantities of diskettes listed indicate the maximum number of diskettes each accessory can contain.



Besides the accessories, IBM provides convenience kits (including the diskettes) for certain systems and devices. The convenience kits and the following diskettes and supplies are available through your IRD representative.

Item	Sold in Multiples of	Weight
Diskettes[1]	10	1.4 kg (3.0 lbs)
Temporary adhesive identification labels (rainbow pack[2] or one color pack)	30 labels (one pack)	—
Protective envelopes (replacement)	50	1.1 kg (2.5 lbs)
Shipping carton for thirty 10-packs[3]	25	24.9 kg (55 lbs)
Top and bottom pads for above carton	50	10.0 kg (22 lbs)
Shipping carton for twenty 10-packs[3]	25	20.9 kg (46 lbs)
Top and bottom pads for above carton	50	7.3 kg (16 lbs)
Shipping carton for ten 10-packs[3]	25	9.1 kg (20 lbs)
Top and bottom pads for above carton	50	4.1 kg (9 lbs)
Shipping carton for five 10-packs[3]	25	6.4 kg (14 lbs)
Top and bottom pads for above carton	50	1.8 kg (4 lbs)
Shipping carton for one 10-pack[3]	25	4.5 kg (10 lbs)
Shipping carton for one diskette	25	3.2 kg (7 lbs)
Die-cut spacer for a 10-pack[3]	25	2.5 kg (5.5 lbs)
Zip-top plastic bags	10	—

[1] Diskettes are shipped in boxes of 10; each diskette is enclosed in a protective envelope. Each box also contains a pack of temporary adhesive labels.
[2] A rainbow pack contains 30 labels, six each of red, blue, yellow, green and gray.
[3] 10-pack is a shortened title for the 10-pack slip case included in the accessory list.

Appendix A. Diskette Users

The following list of diskette using systems and devices is divided by diskette types. Some of the systems and devices appear in more than one place in the list because they use more than one type of diskette. The list is current as of this edition date and will be updated. Note, however, that new using systems and devices may become available between editions or revisions to this manual.

IBM DISKETTE 1

128 Bytes per Sector

IBM 3540 Diskette Input/Output Unit

IBM 3601 Finance Communication Controller, Models 1, 2A, 2B, 3A, and 3B

IBM 3602 Finance Communication Controller

IBM 3741 Data Station

IBM 3742 Dual Data Station

IBM 3747 Data Converter

IBM 3773 Communication Terminal

IBM 3774 Communication Terminal

IBM 3775 Communication Terminal

IBM 3776 Communication Terminal

IBM 3777 Communication Terminal

IBM 3791 Controller

IBM 3881 Optical Mark Reader, Model 3

IBM 3890 Document Processor

IBM 4331 Processor

IBM 4962 Disk Storage Unit, Models 2, 2F, and 4

IBM 4964 Diskette Unit

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5231 Controller, Model 2

IBM 5265 Point of Sale Terminal, all models

IBM 5320 System Unit—System/32

IBM 5340 System Unit—System/34, all models

IBM 5381 System Unit—System/38

IBM 7840 Film Thickness Analyzer

IBM 7841 Textile Color Analyzer

IBM 7842 Coating Analyzer

IBM 8101 Storage and Input/Output Unit

IBM 8130 Processor

IBM 8140 Processor

256 Bytes per Sector

IBM 3601 Finance Communication Controller, Models 1, 2A, 3A, and 3B

IBM 3602 Finance Communication Controller

IBM 3631 Plant Communication Controller, Models 1A and 1B

IBM 3632 Plant Communication Controller, Models 1A and 1B

IBM 3791 Controller

IBM 4962 Disk Storage Unit, Models 2, 2F, and 4

IBM 4964 Diskette Unit

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5381 System Unit—System/38

IBM 8101 Storage and Input/Output Unit

IBM 8130 Processor

IBM 8140 Processor

512 Bytes per Sector

IBM 4962 Disk Storage Unit, Models 2, 2F, and 4

IBM 4964 Diskette Unit

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5320 System Unit–System/32

IBM 5340 System Unit–System/34, all models

IBM 5381 System Unit–System/38

IBM 7840 Film Thickness Analyzer

IBM 7841 Textile Color Analyzer

IBM 7842 Coating Analyzer

IBM DISKETTE 2

128 Bytes per Sector

IBM 4962 Disk Storage Unit, Models 2, 2F, and 4

IBM 4964 Diskette Unit

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5381 System Unit–System/38

256 Bytes per Sector

IBM 3601 Finance Communication Controller, Models 2B and 3B

IBM 3602 Finance Communication Controller, Models 1A and 1B

IBM 3631 Plant Communication Controller, Model 1B

IBM 3632 Plant Communication Controller, Models 1A and 1B

IBM 4962 Disk Storage Unit, Models 2, 2F, and 4

IBM 4964 Diskette Unit

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5381 System Unit–System/38

IBM DISKETTE 2D

256 Bytes per Sector

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5265 Point of Sale Terminal, Models X3X and X4X

IBM 5340 System Unit–System/34, Models X2X and X3X

IBM 5381 System Unit–System/38

IBM 8101 Storage and Input/Output Unit

IBM 8130 Processor

IBM 8140 Processor

512 Bytes per Sector

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5381 System Unit–System/38

1024 Bytes per Sector

IBM 4966 Diskette Magazine Unit

IBM 5114 Diskette Unit

IBM 5340 System Unit–System/34, Models X2X and X3X

IBM 5381 System Unit–System/38

Appendix B. Data Organization

PHYSICAL AND LOGICAL RECORDS

A record is a collection of related items of data that are treated as a unit. You may be able to improve the efficiency of your diskette operations by varying the way you organize the records on your diskettes. The two choices discussed in this appendix and shown in the examples are physical records and logical records.

The sector defines the maximum length of a physical record. The lengths are fixed for each type of diskette. These lengths are: 128, 256, 512, and 1024 bytes (see *IBM Diskette Types,* earlier in this manual). If, however, you choose not to restrict your information to the fixed lengths of the physical records, you may organize your information into logical records.

A logical record is independent of its physical environment because it is not defined in physical terms but rather in terms of the information it contains. Therefore, the relationship between logical and physical records varies. One example of data organization may have logical records divided into portions that occupy one or more physical records. Another example may have several logical records occupying one physical record.

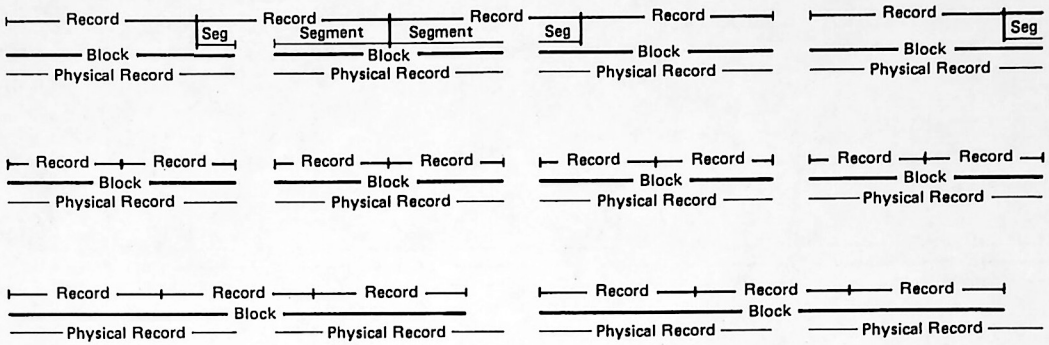
BLOCKING AND SPANNING

A block is a set of adjacent logical records that is recorded as a unit. For basic data exchange and type H exchange, you can set a block to any value greater than zero, but not greater than the physical record length. For other types of diskette data organization, the relationship of the block size to the physical record size can be governed by the constraints of the system.

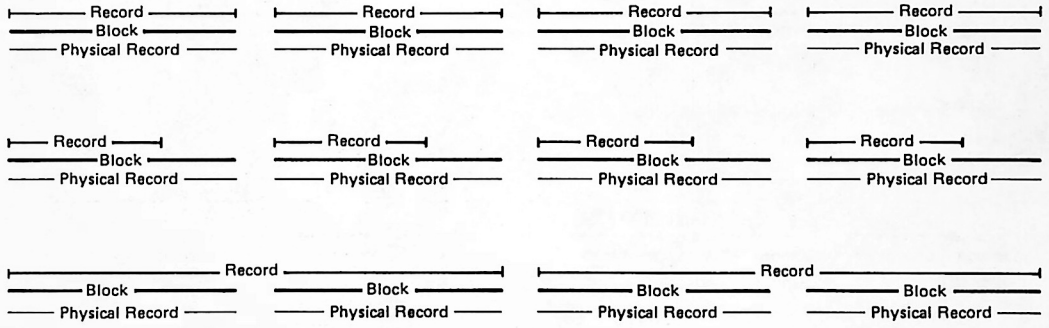
The following paragraph uses illustrations to help clarify the explanations of blocking and spanning. In each of these illustrations, the terms *record* and *physical record* appear. The records shown on the top lines of the illustrations are logical records.

You can place records on the diskette as blocked or unblocked, spanned or unspanned, or in combinations of these four options, for example:

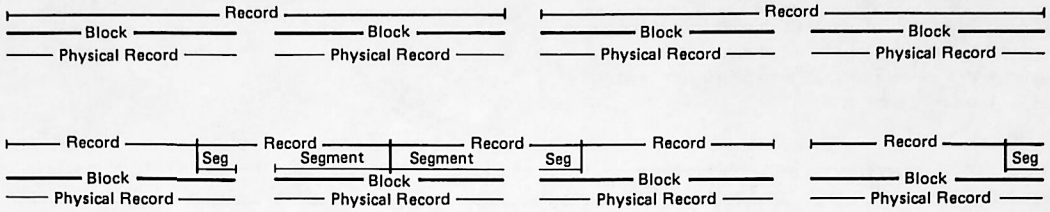
Blocked: One record plus one or more records (or a segment of a record) occupy a single block. The following examples are illustrations of three possible combinations that form blocked records:



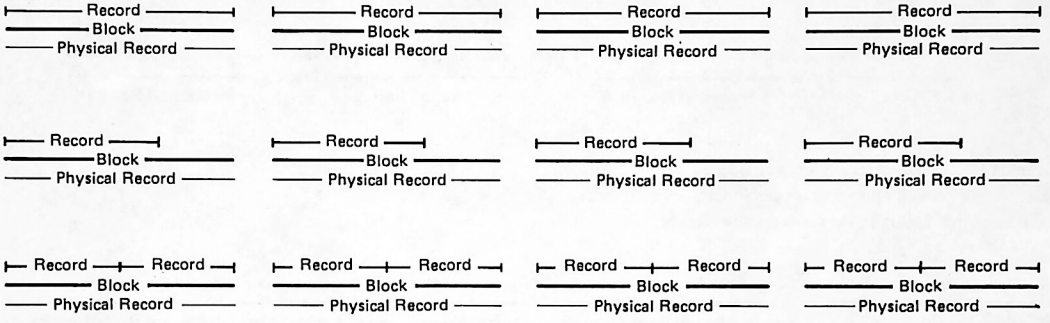
Unblocked: One record exclusively occupies one or more blocks. The following examples are illustrations of three possible combinations that form unblocked records:



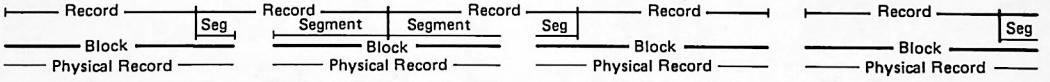
Spanned: One record extends beyond one block. The following examples are illustrations of two possible combinations that form spanned records:



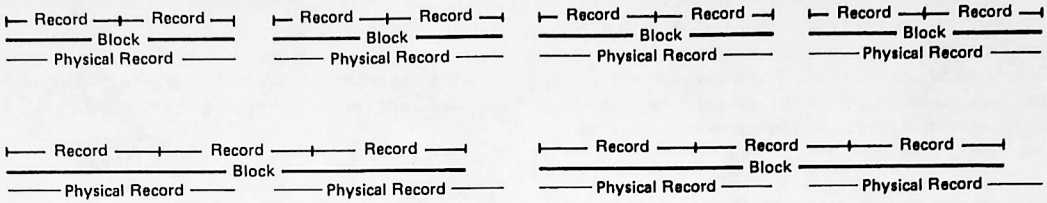
Unspanned: One or more records do not extend beyond one block. The following examples are illustrations of three possible combinations that form unspanned records:



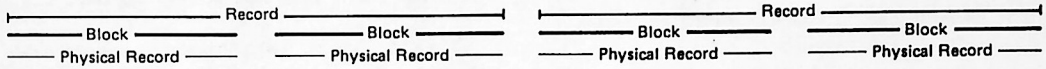
Blocked and Spanned: The following example illustrates the combining of blocked and spanned records:



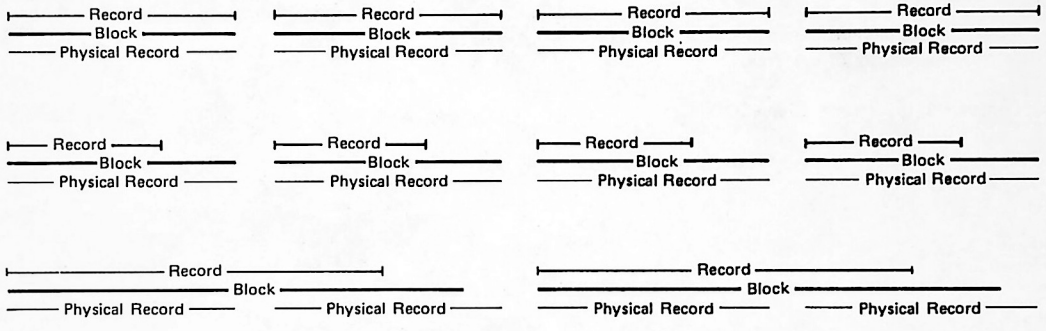
Blocked and Unspanned: The following examples illustrate the combining of blocked and unspanned records:



Unblocked and Spanned: The following example illustrates the combining of unblocked and spanned reccords:



Unblocked and Unspanned: The following examples illustrate the combination of unblocked and unspanned records:



SEQUENTIAL DATA

Sequential data organization provides a way in which you can organize each of the diskette types. In the descriptions that follow, the expression *logical sequence* means that the sectors are read or written in sequence numerically; that is 1, 2, 3, 4, and so on. For ease of illustration, these examples show reading or writing beginning at track or cylinder 1; however, in practice, reading or writing can begin at any track or cylinder.

Because the organization for the IBM Diskette 2 is identical to that for the IBM Diskette 2D, only one description is given.

The IBM Diskette 1: A one-sided diskette that requires only one read/write head. Reading or writing sequentially on this diskette proceeds as follows:

1. Start at track (cylinder) 1; in logical sequence, read or write each sector of the track.
2. Move to track (cylinder) 2; in logical sequence, read or write each sector of the track.
3. Move to track (cylinder) 3; in logical sequence, read or write each sector of the track.
4. Continue in this manner to the EOD.

The IBM Diskettes 2 and 2D: Two-sided diskettes that require read/write heads on each side. The diskette drive switches from read/write head 0 to read/write head 1 electronically. Reading or writing sequentially on this diskette proceeds as follows:

1. Start at cylinder 1 with read/write head 0; in logical sequence, read or write each sector of the track.
2. Still on cylinder 1, switch to head 1; in logical sequence, read or write each sector of the track.
3. Move to cylinder 2, switch back to head 0; in logical sequence, read or write each sector of the track.
4. Still on cylinder 2, switch to head 1; in logical sequence, read or write each sector of the track.
5. Move to cylinder 3, switch back to head 0; in logical sequence, read or write each sector of the track.
6. Still on cylinder 3, switch to head 1; in logical sequence, read or write each sector of the track.
7. Continue in this manner, switching from one side of the diskette to the other . . . to the EOD.

INITIALIZATION

Initialization is a part of the process of preparing a diskette for shipment to the purchaser. Each new diskette is initialized following a careful inspection to ensure that it contains no manufacturing defects that could prevent accurate writing and reading. Initialization writes the label information and data addresses on the diskette recording surface. The formats used for the index cylinder and the data set labels are discussed in Appendix D and Appendix E.

Reinitialization

Some IBM systems have the facilities to reinitialize diskettes. This process permits you to change the size of the sectors on a diskette or to bypass a maximum of two defective cylinders or tracks. Note that unless your system has a special provision for saving the information contained on the diskette, all the information is lost during reinitialization.

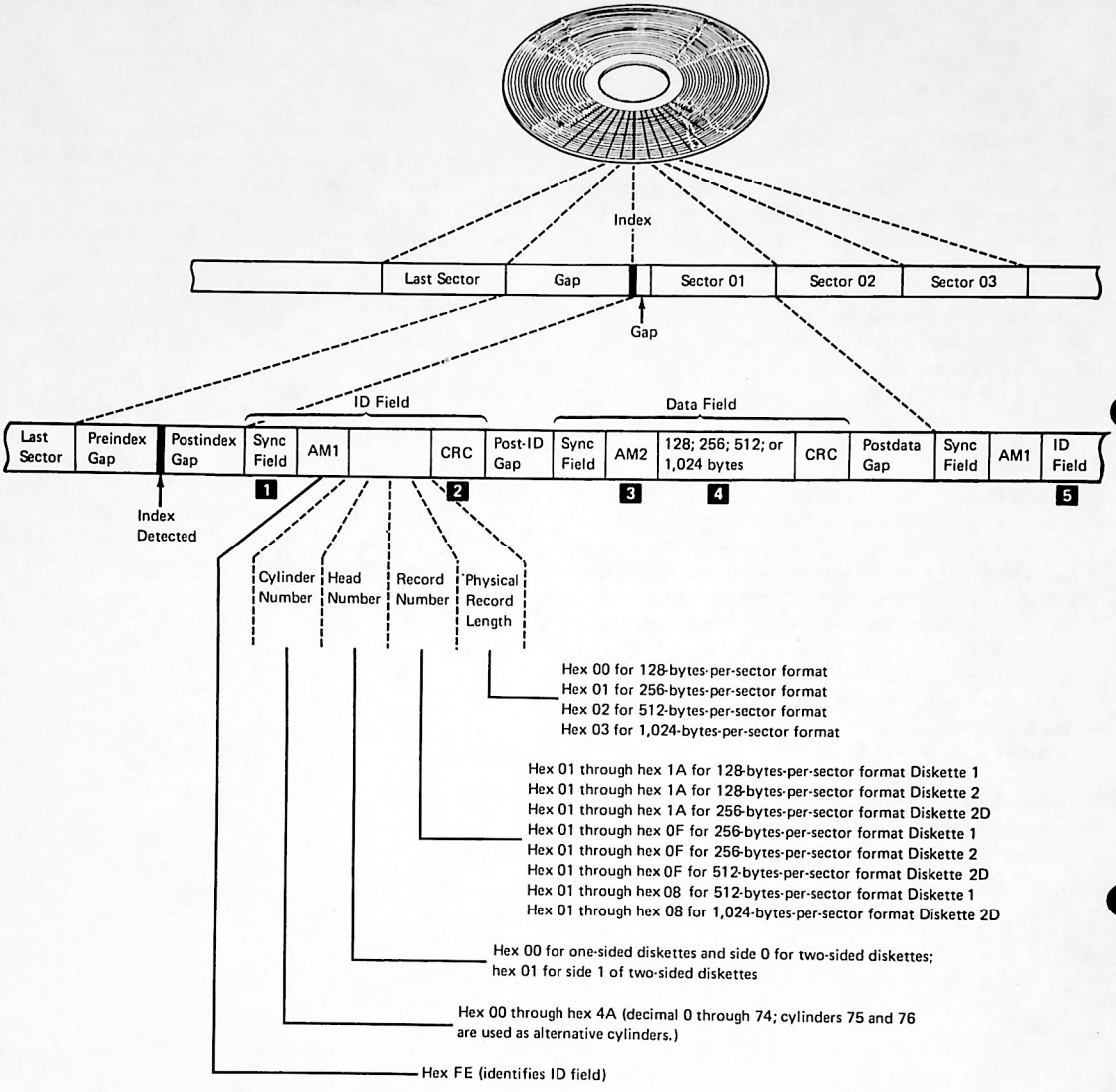
In this process, the system flags a defective cylinder by filling all of the ID fields on that cylinder with binary ones. The system then writes the cylinder number from the defective cylinder into the ID field of the next physical cylinder. This means that the ID from every cylinder whose physical cylinder number is higher in value than the defective cylinder is moved up to the next respective cylinder.

The physical cylinder numbers of defective cylinders are recorded in the error map sector (sector 05 of side 0 of the index cylinder). When the device encounters a defective cylinder during read or write operations, the read/write head automatically moves to the next physical cylinder.

TRACK FORMAT

Except for the index cylinder, each track on a new diskette is initialized to the same basic format. The information in some of the sectors varies with the diskette type. For more details on the contents of the index cylinder and cylinders 1 through 76, see Appendix D and Appendix E.

The following illustration shows how the tracks are formatted at initialization. Also shown on the illustration are numbers that serve as keys to the paragraphs that describe the particular fields.


Index
Last Sector
Gap
Sector 01
Sector 02
Sector 03
Gap
ID Field
Data Field
Last Sector
Preindex Gap
Postindex Gap
Sync Field
AM1
CRC
Post-ID Gap
Sync Field
AM2
128; 256; 512; or 1,024 bytes
CRC
Postdata Gap
Sync Field
AM1
ID Field
1
2
3
4
5
Index Detected
Cylinder Number
Head Number
Record Number
Physical Record Length
Hex 00 for 128-bytes-per-sector format
Hex 01 for 256-bytes-per-sector format
Hex 02 for 512-bytes-per-sector format
Hex 03 for 1,024-bytes-per-sector format
Hex 01 through hex 1A for 128-bytes-per-sector format Diskette 1
Hex 01 through hex 1A for 128-bytes-per-sector format Diskette 2
Hex 01 through hex 1A for 256-bytes-per-sector format Diskette 2D
Hex 01 through hex 0F for 256-bytes-per-sector format Diskette 1
Hex 01 through hex 0F for 256-bytes-per-sector format Diskette 2
Hex 01 through hex 0F for 512-bytes-per-sector format Diskette 2D
Hex 01 through hex 08 for 512-bytes-per-sector format Diskette 1
Hex 01 through hex 08 for 1,024-bytes-per-sector format Diskette 2D
Hex 00 for one-sided diskettes and side 0 for two-sided diskettes; hex 01 for side 1 of two-sided diskettes
Hex 00 through hex 4A (decimal 0 through 74; cylinders 75 and 76 are used as alternative cylinders.)
Hex FE (identifies ID field)

1 Binary zero sync bytes

2 Cyclic redundancy check. The check bytes are generated during a write operation and are used during both write and read operations to verify that the data is correct.

3 Various systems have the ability to modify records or the locations of records. These modifications are as follows:

- Logically delete a record
- Move a record from a defective sector to the next sequential sector
- Move a record from a defective sector to an alternative sector

These modifications are made by changing the contents of the address marker AM2 and the first character of the data field that immediately follows AM2. When the first character of the data field changes, the data field changes to a control field that designates what type of modification was made.

Note: The address marker AM2 usually contains a hex FB. When any of the three modifications is necessary, AM2 is changed to hex F8. F8 alerts the device to check the first character of the next field.

4 The value of the first character of this field specifies the type of modification that has affected the record that previously occupied the sector. The characters used and their significance are:

- D, which means delete the record. During subsequent read operations, the device ignores the remaining contents of this sector.
- F, which means move the record to the next sequential sector. During subsequent read operations, the device ignores the remaining contents of this sector and searches for the record in the next sequential sector.
- . (period), which means move the record to a sector that has been allocated as an alternative sector. The address of the alternative sector is written in the error directory (sector 05 on side 0 of the index cylinder). During subsequent read operations, the device reads the period and searches for the sector address in the error directory (error map).

5 The ID field contains the sync field, address marker 1, the address and length of the record, and CRC bits. From this information, the system can identify and locate the record. If the cylinder is defective, all the ID fields on that cylinder are filled with binary ones.

Appendix D. Index Cylinder Layout

Every new IBM diskette is inspected and initiated. The following table lists the sectors of the index cylinder, the byte positions within the sectors, the purposes for those positions, and the values written in the byte positions. Occasionally, you will find a number in parentheses in the *Initialized To:* column. These numbers represent the various diskette types:

(128-1) = a one-sided diskette with 128 bytes per sector

(256-1) = a one-sided diskette with 256 bytes per sector

(512-1) = a one-sided diskette with 512 bytes per sector

(128-2) = a two-sided diskette with 128 bytes per sector

(256-2) = a two-sided diskette with 256 bytes per sector

(256-2D) = a two-sided, double-density diskette with 256 bytes per sector

(512-2D) = a two-sided, double-density diskette with 512 bytes per sector

(1024-2D) = a two-sided, double-density diskette with 1024 bytes per sector

Where there is a difference in the value written for a particular diskette type, the *Initialized To:* column shows both the number that represents the diskette type and the value assigned to that diskette type. The following example from the *Initialized To:* column shows that the value for two of the diskette types differs from the value assigned to the other diskette types. The values are shown in hexadecimal:

(128-1) = Hex 40

(256-1) = Hex C2

(512-1) = Hex 40

(128-2) = Hex 40

(256-2) = Hex C2

(256-2D) = Hex 40

(512-2D) = Hex 40

(1024-2D) = Hex 40

The Index Cylinder on a New IBM Diskette

Side	Sector	Positions and Use	Initialized To:
0	01	Positions 1—80 are reserved for IPL and IMPL.	Hex 40
		Positions 81—128 are reserved for IPL and IMPL.	Hex 00
0	02	Positions 1—80 are reserved for IPL and IMPL.	Hex 40
		Positions 81—128 are reserved for IPL and IMPL.	Hex 00
0	03	Positions 1—80 are reserved for system scratch.	Hex 40
		Positions 81—128 are reserved for system scratch.	Hex 00

Side	Sector	Positions and Use	Initialized To:
0	04	Positions 1–80 are reserved.	Hex 40
		Positions 81–128 are reserved.	Hex 00
0	05	Positions 1–5 = ERMAP. (ERMAP is a label that identifies this record as an error map.)	ERMAP
		Position 6 is a separator and contains a blank.	Hex 40
		Positions 7–8 contain blanks if no defective cylinders exist. If defective cylinders exist, positions 7–8 contain the number of the first defective physical cylinder.	Hex 40
		Position 9 is a blank if no defective cylinder exists. If one or more defective cylinders exist, position 9 contains a zero.	Hex 40
		Position 10 is a separator and contains a blank.	Hex 40
		Positions 11–12 contain blanks if one or no defective cylinder exists. If more than one defective cylinder exists, positions 11–12 contain the number of the second defective physical cylinder.	Hex 40
		Position 13 is a blank if one or no defective cylinder exists. If more than one defective cylinder exists, position 13 contains a zero.	Hex 40
		Position 14 is a separator and contains a blank.	Hex 40
		Positions 15–22 are reserved.	Hex 40
		Position 23 is the defective record indicator. It contains a blank to indicate that no defective records to be handled by the alternative physical record method are contained within the data portion of any data set extent on the volume. At least one such defective record exists if position 23 contains a D.	Hex 40
		Position 24 is the error directory indicator. It contains a blank to indicate that no format or alternative physical record relocation has been previously specified. B or C indicates the defective physical records have had their contents relocated to a data set named ERRORSET. B indicates the addresses of the defective physical records have been recorded in the error directory in the discontinuous binary format (0CHR). C indicates that the addresses of the defective physical records have been recorded in the error directory in the character decimal format (bCCHRR).	(128-1) = Hex 40 (256-1) = Hex C2 (512-1) = Hex 40 (128-2) = Hex 40 (256-2) = Hex C2 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40

Side	Sector	Positions and Use	Initialized To:
0	05 (cont.)	Positions 25–72 are the error directory. This directory contains entries of addresses of physical records containing one or more defects. In the discontinuous binary format (0CHR), this field can contain addresses of up to 12 relocated physical records. In the character decimal format (bCCHRR), this field can contain the address of up to 8 relocated physical records. The relocated records are contained in a data set named ERRORSET in the same sequence as the addresses in the directory. Unused positions of the error directory must contain binary zeros if position 24 contains a B. If position 24 contains a C, unused portions of the error directory must contain blanks.	(128-1) = Hex 40 (256-1) = Hex 00 (512-1) = Hex 40 (128-2) = Hex 40 (256-2) = Hex 00 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40
		Positions 73–80 are reserved.	Hex 40
		Positions 81–128 are padded.	(128-1) = Hex 00 (256-1) = Hex 00 (512-1) = Hex 00 (128-2) = Hex 00 (256-2) = Hex 00 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40
0	06	Positions 1–80 are reserved.	Hex 40
		Positions 81–128 are reserved.	Hex 00
0	07	This sector is called the volume label. Various fields in this sector identify the diskette: the owner, security, sequence, and length of physical records.	
		Positions 1–4 identify the sector as a volume label.	VOL1
		Positions 5–10 are called the volume identifier. This field can contain the same volume identifier (serial number) that is written on the diskette permanent label. The ID consists of one to six digits or letters. The first character must be in position 5 of the sector, and any unused positions in the field to the right of the ID data must be blanks. No blanks are allowed between digits or letters in this field. When the diskette is initialized by an IBM device, this field will contain the value specified as part of the initialization procedure.	IBMIRD
		Position 11 is the volume accessibility field. A blank in this field permits access to the diskette. Any nonblank character in this field means additional qualifications are required for further access.	Hex 40
		Positions 12–37 are reserved.	Hex 40
		Positions 38–51 are called the owner identifier field. This field is not used by some systems.	Hex 40
		Positions 52–64 are reserved.	Hex 40

Side	Sector	Positions and Uses	Initialized To:
0	07 (cont.)	Position 65 is the label extension indicator. The character in this position (space or 1 through 9) indicates the number of cylinders (in addition to cylinder 0) that are allocated as system area needed for data set labels. A non-space value is only allowed on the IBM Diskette 2D. The indicator values mean: Space = No additional cylinders allocated (all data set labels are on cylinder 0). 1 = Cylinder 1 is reserved as system area. 2 = Cylinders 1 and 2 are reserved as system area. 3 = Cylinders 1, 2, and 3 are reserved as system area. 4–9 = A maximum of nine additional cylinders can be reserved as system area. The value in position 65 must be entered when the diskette is initialized and must not be changed during normal label processing. Using systems are not required to read or write the data sets whose labels are in the extended system area, but all systems must be able to detect position 65. When the system does not support label extension, allocation must be prohibited if position 65 equals any value other than space. Data sets with labels on cylinder 0 can be read or updated as long as the data set extents are not modified. However, any data sets that have labels in the extended system area are not accessible and must not be identified as type H exchange.	Hex 40
		Positions 66–71 are reserved.	Hex 40
		Position 72 is the volume surface indicator and contains either a blank, a 2, or an M. A blank indicates one recording surface; 2 indicates two recording surfaces; M indicates two double-density recording surfaces.	(128-1) = Hex 40 (256-1) = Hex 40 (512-1) = Hex 40 (128-2) = Hex F2 (256-2) = Hex F2 (256-2D) = Hex D4 (512-2D) = Hex D4 (1024-2D) = Hex D4
		Position 73 is the extent arrangement indicator and contains a blank or a P. A blank indicates there are no special constraints on the arrangement of extents, data set labels, or unallocated space on this diskette. P indicates the extents must be adjacent and must begin at cylinder 1, head 0, sector 1. P also indicates that the data set labels must begin at cylinder 0, head 0, sector 8 and must be in the same sequence as the extents they describe. P also indicates that all unallocated space must follow the last data set extent on the volume. If any unused space is created elsewhere, the extents must be rearranged to eliminate the space, or this field must be changed to a blank.	Hex 40
		Position 74 is the special requirements indicator and contains a blank or an R. A blank indicates that there are no special requirements for accessing data on this volume. R indicates that some of the data sets were recorded in a logically nonsequential manner.	Hex 40
		Position 75 is reserved.	Hex 40

Side	Sector	Positions and Use	Initialized To:
0	07 (cont.)	Position 76 identifies the length of the physical record (sector) on cylinders 1 through 76 and contains a blank, 1, 2, or 3: Blank = 128 bytes 1 = 256 bytes 2 = 512 bytes 3 = 1024 bytes	(128-1) = Hex 40 (256-1) = Hex F1 (512-1) = Hex F2 (128-2) = Hex 40 (256-2) = Hex F1 (256-2D) = Hex F1 (512-2D) = Hex F2 (1024-2D) = Hex F3
		Positions 77—78 are the physical record (sector) sequence code. This field contains blanks or the characters 01 through 13 and indicates the physical sequence of the sectors. A blank or 1 indicates the sectors are physically sequential. Otherwise, this field is used as an increment to determine the next physical sector. Diskettes initialized on an IBM device may have a value specified as part of the initialization procedure.	Hex 40
		Position 79 is reserved.	Hex 40
		Position 80 is the label standard version field. W indicates that IBM standard labels are on the diskette.	W
		Positions 81—128 are padded.	(128-1) = Hex 00 (256-1) = Hex 00 (512-1) = Hex 00 (128-2) = Hex 00 (256-2) = Hex 00 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40
0	08—26	These sectors are used to record the data set labels that define the data sets recorded on cylinders 01 through 74 of the diskette. Sectors 09 through 26 on side 0 and sectors 01 through 26 on side 1 are initialized as deleted records. (See Appendix E.)	(See Appendix E.)
1	01—26		

Every new IBM diskette is inspected and initialized. The following table lists the character positions and labels, descriptions of the labels, and the values written in the character positions. Occasionally, you will find a number in parentheses in one or both of the *Initialized To:* columns. These numbers represent the various diskette types:

(128-1) = a one-sided diskette with 128 bytes per sector

(256-1) = a one-sided diskette with 256 bytes per sector

(512-1) = a one-sided diskette with 512 bytes per sector

(128-2) = a two-sided diskette with 128 bytes per sector

(256-2) = a two-sided diskette with 256 bytes per sector

(256-2D) = a two-sided, double-density diskette with 256 bytes per sector

(512-2D) = a two-sided, double-density diskette with 512 bytes per sector

(1024-2D) = a two-sided, double-density diskette with 1024 bytes per sector

Where there is a difference in the value written for a particular diskette type, the *Initialized To:* columns show both the number that represents the diskette type and the value assigned to that diskette type. The following example from the *Initialized To:* columns shows that the value for three of the diskette types differs from the value assigned to the other diskette types. The values are shown in hexadecimal (the character b represents a blank):

(128-1) = DDR1

(256-1) = Dbbb

(512-1) = Dbbb

(128-2) = DDR1

(256-2) = Dbbb

(256-2D) = DDR1

(512-2D) = DDR1

(1024-2D) = DDR1

Data Set Labels on a New IBM Diskette				
			Initialized To:	
Character Position	Label	Description	Sector 08, Side 0	Sectors 09–26, Side 0 and Sectors 01–26, Side 1
1–4	Label ID (identifier)	Label identifier for system application	HDR1	(128-1) = DDR1 (256-1) = Dbbb (512-1) = Dbbb (128-2) = DDR1 (256-2) = Dbbb (256-2D) = DDR1 (512-2D) = DDR1 (1024-2D) = DDR1
5		Position 5 is reserved	b	b
6–22	Data set identifier	User name for data set. The name must be 1 to 17 characters. The first character must be alphabetic. No blanks are allowed between characters. Duplicate names are not permitted on the same diskette. For basic data exchange and type H exchange, only the first 8 characters are used. The names ERRORSET, SYSAREA, and ERMAP are reserved for special use.	DATAb...b	(128-1) = DATA09b...b through DATA26b...b (256-1) = b...b (512-1) = b...b (128-2) = DATA09b...b through DATA26b...b (256-2) = b...b (256-2D) = DATA09b...b through DATA26b...b and DATA27b...b through DATA77b...b** (512-2D) = DATA09b...b through DATA26b...b and DATA27b...b through DATA77b...b** (1024-2D) = DATA09b...b through DATA26b...b and DATA27b...b through DATA77b...b** **These are the odd-numbered bytes (DATA27, 29, 31,...75, 77); the even-numbered bytes are in positions 134 through 150.

Character Position	Label	Description	Initialized To:	
			Sector 08, Side 1	Sectors 09—26, Side 0 and Sectors 01—26, Side 1
23—27	Block length	This field contains a numeric value that specifies the maximum number of characters per block. At label creation, the contents must be entered. Blocks must begin on physical record boundaries. For a basic exchange data set, this field must be 1—128. For a type H data set, this field must be 1—256.	(128-1) = ƀƀ080 (256-1) = 00256 (512-1) = ƀƀ512 (128-2) = ƀƀ128 (256-2) = 00256 (256-2D) = ƀƀ256 (512-2D) = ƀƀ512 (1024-2D) = ƀ1024	(128-1) = ƀƀ080 (256-1) = ƀƀƀƀƀ (512-1) = ƀƀ512 (128-2) = ƀƀ128 (256-2) = ƀƀƀƀƀ (256-2D) = ƀƀ256 (512-2D) = ƀƀ512 (1024-2D) = ƀ1024
28	Record attribute	Indicates blocking used within the data set. When the exchange type indicator (position 44) is a blank or H, this field must be a blank. ƀ = Records unblocked, unspanned R = Records blocked, spanned B = ecords blocked, unspanned S = Records unblocked, spanned	ƀ	ƀ
29—33	Beginning of extent (BOE)	Identifies the address of the first sector of the data set. Positions 29—30 contain the cylinder number, position 31 contains the head number, and positions 32—33 contain the sector number. (Some systems use a logical record number. In this case, position 74 of the volume label contains an R.)	01001	(128-1) = 74001 (256-1) = ƀƀƀƀƀ (512-1) = 75001 (128-1) = 75001 (256-2) = ƀƀƀƀƀ (256-2D) = 75001 (512-2D) = 75001 (1024-2D) = 75001
34	Physical record length	Indicates physical record length: ƀ = 128 bytes per record 1 = 256 bytes per record 2 = 512 bytes per record 3 = 1024 bytes per record The value in this field must be the same as position 76 of the volume label. When the exchange type indicator (position 44) is a blank, this field must be a blank. When position 44 is H, this field must contain a 1.	(128-1) = ƀ (256-1) = 1 (512-1) = 2 (128-2) = ƀ (256-2) = 1 (256-2D) = 1 (512-2D) = 2 (1024-2D) = 3	(128-1) = ƀ (256-1) = ƀ (512-1) = 2 (128-2) = ƀ (256-2) = ƀ (256-2D) = 1 (512-2D) = 2 (1024-2D) = 3

Character Position	Label	Description	Initialized To:	
			Sector 08, Side 0	Sectors 09–26, Side 0 and Sectors 01–26, Side 1
35–39	End of extent (EOE)	Identifies the address of the last sector reserved for this data set, using the same format as BOE.	(128-1) = 73026 (256-1) = 74015 (512-1) = 74108 (128-2) = 74126 (256-2) = 74115 (256-2D) = 74126 (512-2D) = 74115 (1024-2D) = 74108	(128-1) = 73026 (256-1) = ƀƀƀƀ (512-1) = 74108 (128-2) = 74126 (256-2) = ƀƀƀƀ (256-2D) = 74126 (512-2D) = 74115 (1024-2D) = 74108
40	Record/ block format	This field contains a blank or F and indicates fixed-length records in fixed blocks. When the exchange type indicator (position 44) is a blank or H, this field must be blank.	ƀ	ƀ
41	Bypass indicator	Indicates a data set to be skipped during exchange or copy operations when transmitting or transferring the data sets on the volume. If this position is set to a blank, the data set is transferred; if it is set to B, the data set is not transferred.	ƀ	ƀ
42	Data set security	A blank indicates the data set is not secured (can be accessed). A non-blank character means restricted access. When the position is non-blank, the volume accessibility indicator in the volume label (track 00, sector 07) must also be nonblank.	ƀ	ƀ
43	Write protect	If this data set contains a P, the data set can be read only. This field must be a blank to allow both reading and writing.	ƀ	ƀ
44	Exchange type indicator	A blank indicates the data set can be used for basic data exchange; H indicates the data set is a type H data set. An E indicates that additional label checking must be performed in order to exchange the data set. (See Appendix F.)	(128-1) = ƀ (256-1) = E (512-1) = E (128-2) = ƀ (256-2) = E (256-2D) = H (512-2D) = E (1024-2D) = E	(128-1) = ƀ (256-1) = ƀ (512-1)= E (128-2) = ƀ (256-2) = ƀ (256-2D) = H (512-2D) = E (1024-2D) = E

Character Position	Label	Description	Initialized To:	
			Sector 08, Side 0	Sectors 09–26, Side 0 and Sectors 01–26, Side 1
45	Multi-volume indicator	A blank in this field indicates a data set is wholly contained on this diskette; C indicates a data set is continued on another diskette; L indicates the last diskette on which a continued data set resides.	b	b
46–47	Volume sequence number	Specifies the sequence of volumes in a multivolume data set. The sequence must be consecutive, beginning with 01 (to a maximum of 99). Blanks indicate that volume sequence checking is not to be performed on this volume and all subsequent volumes of a multivolume data set.	bb	bb
48–53	Creation date	May be used to record the date the data set was created. The format is YYMMDD, where YY is the low-order 2 digits of the year, MM is a 2-digit representation of the month, and DD is a 2-digit representation of the day of the month. Blanks indicate that the creation date is not significant.	bbbbbb	bbbbbb
54–57	Record length	At label creation, record length must be defined. A blank means the record length equals the block length defined in position 23. (A blank or H in position 44 also means record length equals block length; therefore, this field can be ignored.)	bbbb	bbbb
58–62	Offset to next record space	This field indicates the starting position for the next sequential record relative to the end of the last block before EOD (end of data) and contains blanks or a decimal value to be used as a negative displacement. Blanks mean zero displacement from the next block (starts at EOD address). This field is used only in conjunction with blocked records.	bbbbb	bbbbb

Character Position	Label	Description	Initialized To:	
			Sector 08, Side 0	Sectors 09–26, Side 0 and Sectors 01–26, Side 1
63–66		Positions 63–66 are reserved.	ƀƀƀƀ	ƀƀƀƀ
67–72	Expiration date	May be used to contain the date the data set (and its label) may be deleted. The format is the same as creation date (positions 48–53). All blanks indicate the data set is considered expired. All 9s indicate the data set will never expire.	ƀƀƀƀƀƀ	ƀƀƀƀƀƀ
73	Verify/ copy indicator	This field must contain a blank, V, or C. A blank must be entered here when the data set is created. Systems that support verification enter a V to indicate the data set has been verified. Systems that support copy verification enter a C to indicate the data has been successfully transferred to another medium (for example, tape, transmission network). Do not enter C for partial data set copy or for null data set.	ƀ	ƀ
74	Data set organization	This field must contain a blank, S, or D. A blank or S indicates sequential data organization. (See Appendix B.) D means some organization that does not permit the sequential relocation method of processing defective physical records. When the exchange type indicator (position 44) is a blank or H, this field must contain a blank.	ƀ	ƀ

Character Position	Label	Description	Initialized To:	
			Sector 08, Side 0	Sectors 09–26, Side 0 and Sectors 01–26, Side 1
75–79	End of data (EOD)	Identifies the address of the next unused sector within the data set extent, using the same format as BOE. If this field is the same as BOE, the extent contains a null data set. If this field contains the address of the next block beyond the extent (for unblocked, unspanned records), the entire extent has been used. For blocked or spanned records, this field must be used with offset to next record space (positions 58–62) to determine the end of actual data recorded.	01001	(128-1) = 74001 (256-1) = ƀƀƀƀƀ (512-1) = 75001 (128-2) = 75001 (256-2) = ƀƀƀƀƀ (256-2D) = 75001 (512-2D) = 75001 (1024-2D) = 75001
80		Position 80 is reserved.	ƀ	ƀ
81–128		Positions 81–128 are padded.	(128-1) = Hex 00 (256-1) = Hex 00 (512-1) = Hex 00 (128-2) = Hex 00 (256-2) = Hex 00 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40	(128-1) = Hex 00 (256-1) = Hex 00 (512-1) = Hex 00 (128-2) = Hex 00 (256-2) = Hex 00 (256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40

The following positions apply only to the double-density diskettes (2D), Side 1:

Character Position	Label	Description	Initialized To: Sectors 01–26, Side 1
129–132		Same as positions 1–4.	(256-2D) = DDR1 (512-2D) = DDR1 (1024-2D) = DDR1
133		Same as position 5.	ƀ
134–150		Same as positions 6–22.	(256-2D) = DATA28ƀ...ƀ through DATA78ƀ...ƀ** (512-2D) = DATA28ƀ...ƀ through DATA78ƀ...ƀ** (1024-2D) = DATA28ƀ...ƀ through DATA78ƀ...ƀ** **These are the even-numbered bytes (DATA28, 30, 32,...76, 78); the odd-numbered bytes are in positions 6 through 22.

Character Position	Label	Description	Initialized To: Sectors 01–26, Side 1
151–155		Same as positions 23–27.	(256-2D) = ƀƀ256 (512-2D) = ƀƀ512 (1024-2D) = ƀ1024
156		Same as position 28.	ƀ
157–161		Same as positions 29–33.	(256-2D) = 75001 (512-2D) = 75001 (1024-2D) = 75001
162		Same as position 34.	(256-2D) = 1 (512-2D) = 2 (1024-2D) = 3
163–167		Same as positions 35–39.	(256-2D) = 74126 (512-2D) = 74115 (1024-2D) = 74108
168		Same as position 40.	ƀ
169		Same as position 41.	ƀ
170		Same as position 42.	ƀ
171		Same as position 43.	ƀ
172		Same as position 44.	(256-2D) = H (512-2D) = E (1024-2D) = E
173		Same as position 45.	ƀ
174–175		Same as positions 46–47.	ƀƀ
176–181		Same as positions 48–53.	ƀƀƀƀƀƀ
182–185		Same as positions 54–57.	ƀƀƀƀ
186–190		Same as positions 58–62.	ƀƀƀƀƀ
191–194		Same as positions 63–66.	ƀƀƀƀ
195–200		Same as positions 67–72.	ƀƀƀƀƀƀ
201		Same as position 73.	ƀ
202		Same as position 74.	ƀ

Character Position	Label	Description	Initialized To: Sectors 01–26, Side 1
203–207		Same as positions 75–79.	(256-2D) = 75001 (512-2D) = 75001 (1024-2D)= 75001
208		Same as position 80.	ƀ
209–256		Same as positions 81–128.	(256-2D) = Hex 40 (512-2D) = Hex 40 (1024-2D) = Hex 40

Appendix F. Data Exchange

Data exchange is the name given to a process whereby information is written on a diskette at one system and used in another system. To ensure that the exchange of information can be accomplished efficiently and without errors, certain standard formats have been established. These formats are basic data exchange, type H data exchange, and type E general exchange.

BASIC DATA EXCHANGE

Basic exchange data sets have requirements assuring that diskettes may be exchanged between systems capable of reading and writing both the IBM Diskette 1 and the IBM Diskette 2.

For basic exchange data sets, the exchange type indicator (data set label position 44) must be blank. This means:

- The data set is organized sequentially.
- The records are a maximum of 128 bytes long.
- The records are of fixed length, unblocked, and unspanned.
- The physical record length is 128 bytes.
- The data set identifier (data set label positions 6 through 22) is no longer than eight positions.

Additional requirements vary between the IBM Diskette 1 and 2. IBM Diskette 1 must:

- Be initialized with physically sequential records (Volume label positions 77 and 78 are specified either ƀƀ (blank) or 01.)
- Have basic exchange data sets on tracks 1 through 73 only

IBM Diskette 2 must:

- Be initialized with physically sequential records (Volume label positions 77 and 78 may be specified ƀƀ (blank) or 01 through 13.)
- Have basic exchange data sets on cylinders 1 through 74

No diskette containing basic exchange data sets is allowed to use alternative physical record relocation.

TYPE H DATA EXCHANGE

Type H exchange data sets have requirements assuring that diskettes may be exchanged between systems capable of reading and writing the IBM Diskette 2D.

For type H exchange data sets, the exchange type indicator (data set label position 44) must be an H. This means:

- The data set is organized sequentially.
- The records are a maximum of 256 bytes long.
- The records are of fixed length, unblocked, and unspanned.
- The physical record length is 256 bytes.
- The data set identifier (data set label positions 6 through 22) is not longer than eight positions.

In addition, a diskette containing type H exchange data sets may be initialized with physically nonsequential records (volume label positions 77 and 78 are space or 01 through 13).

In a type H exchange data set, alternative physical record relocation is not allowed.

TYPE E GENERAL EXCHANGE

Type E exchange data sets have requirements that force the using system to examine each field in the header label. None of these fields can be assumed or summarized.

For type E exchange data sets, the exchange type indicator (data set label position 44) must be an E. This means:

- On output, all supported fields must contain values that accurately describe the data set, and all unsupported fields must contain space characters.
- On input, all supported fields must be checked to accurately determine the attributes of the data set.

address: The location of any physical record on the diskette, specified by the cylinder number, head number, and record number. (In publications describing the location of a physical record on a one-sided diskette, the address might be specified by track number, 00, and record number.)

AM: Address marker.

basic data exchange: A format for exchanging data on diskettes between systems or devices that use the IBM Diskettes 1 and 2.

block: A set of adjacent logical records recorded as a unit.

blocking: Combining two or more records into one block.

BOE: Beginning of extent.

byte: A sequence of adjacent binary digits operated on as a unit; the representation of one character.

C: Celsius.

cm: Centimeters.

cyclic redundancy check: A method of error checking performed when reading or writing data.

cylinder: The tracks that can be accessed without repositioning the read/write heads.

data set: The major unit of data storage, consisting of a collection of data records stored in a user-specified format.

diskette drive: The portion of the system or device that handles the diskette functions.

diskette envelope: The removable, protective envelope in which the diskette is stored.

diskette jacket: The permanent, protective cover that houses the flexible disk.

diskette magazine: A container for up to 10 diskettes; used on the diskette magazine drive.

diskette magazine drive: A diskette drive that automatically loads and unloads the diskettes from a diskette magazine.

double density: Bits written on the IBM Diskette 2D at twice the density used on IBM Diskettes 1 and 2.

drive spindle: The portion of the diskette drive that is inserted in the diskette and revolves, turning the disk within the jacket.

EOD: End of data.

EOE: End of extent.

F: Fahrenheit.

head: See *read/write* head.

ID: Identification.

IMPL: Initial microprogram load.

index cylinder: Cylinder 00. This cylinder is used to store information about the diskette.

index hole: The small hole in the disk and the jacket; used for timing.

initialization: The process of writing the addresses, index cylinder information, and other system information on the diskette. (Initialization is also used to assign alternative cylinders.)

IPL: Initial program load.

IRD: Information Records Division.

kg: Kilograms.

logical record: A record that does not necessarily conform to the boundaries of a physical record. The logical record can be longer than the physical record, shorter than the physical record, or one of several logical records within a single physical record.

permanent diskette label: The label attached permanently to the upper left corner of the diskette jacket.

physical record: One or more records written within one sector on a track.

read (operation): The process of sensing the magnetic fields on the diskette recording surface and converting them into signals appropriate for use by the system or device.

read/write head: The unit in the diskette drive that reads from or writes on the diskette recording surface.

record: A collection of related items of data, treated as a unit.

recording surface: The portion of the diskette that is used to store information.

sector: The addressable unit into which each track is divided.

spanned record: A logical record stored in more than one block.

temporary identification label: The removable label attached to the upper right corner of the diskette jacket.

track: That portion of the diskette recording surface available to one read/write head at each access position.

type E general exchange: A method for exchanging unformatted data on diskettes. This exchange requires the using system to examine the header labels.

type H data exchange: A format for exchanging data on diskettes between systems or devices that use the IBM Diskette 2D.

unblocked: One logical record that exclusively occupies one or more blocks.

unspanned: One or more logical records that do not extend beyond one block.

write (operation): The process of generating magnetic fields on the diskette recording surface.

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